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Bidirectional translator between DXF and IGES formats. Final report Progress rept

Allied-Signal Aerospace Co., Kansas City, MO. Kansas City Div

Bradford, J. R.

Aug 90 46p

Order number DE90016430CCI, $17

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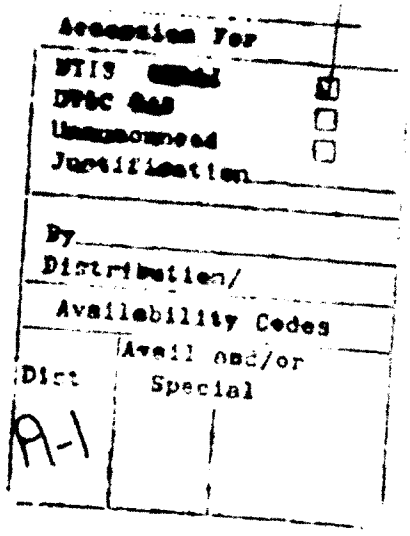
BIDIRECTIONAL TRANSLATOR BETWEEN DXF AND IGES FORMATS

J. R. Bradford

Published August 1990

Final Report
J. R. Bradford, Project Leader

Project Team:
F. Summa, University of Missouri, Kansas City



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BIDIRECTIONAL TRANSLATOR BETWEEN DXF AND IGES FORMATS

KCP-613-4172, Final Report, Published August 1990

Prepared by J. R. Bradford

Software was conceived that provided two-way CAD data exchange between AutoCAD's DXF format and the IGES format. Obstacles were found with a newly emerging DXF format, and enhancements were added to accommodate multiple DXF forms. Successful code was written using the C programming language, thus providing portability to other hardware. Future enhancements to the code were identified.

SW:mc

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A prime contractor with the United States Department of Energy under Contract Number DE-AC04-76-DP00613

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SUMMARY

A software development project was initiated in January 1988 between Allied-Signal Inc., Kansas City Division (KCD), and the University of Missouri, Kansas City (UMKC), to provide bidirectional CAD data exchange capability between AutoCAD's Data Exchange Format (DXF) and the Initial Graphics Exchange Specification (IGES) format.

More CAD activity is occurring using personal computer (PC) based CAD software, and the DXF format has become the PC CAD industry de facto standard. Translators between DXF and IGES are necessary for communication between PC CAD and larger CAD systems. Existing IGES to DXF translators have proven unsatisfactory.

Software developed during this project provides a robust exchange capability between DXF and IGES. Possession of the software's source code provides a measure of control, allowing corrections and enhancements to be added in a timely manner. Because the source code is written using the C programming language, porting to other hardware running AutoCAD is simplified. Software features include (1) the ability to translate from IGES to either AutoCAD's V2.52 or V9 format of DXF, (2) user input of significant digits for real number output, and (3) dynamic memory reallocation so larger files may be processed.

DISCUSSION

SCOPE AND PURPOSE

More CAD activity is occurring using personal computer (PC) based CAD software, and the DXF format has become the PC CAD industry de facto standard for interfacing other software applications. Larger CAD systems use the ANSI standard IGES for CAD data exchange. Any desired communication between PC CAD software and these larger CAD systems requires translation between DXF and IGES formats. Vendors' DXF to IGES translators have proven unsatisfactory when used to translate between Tool Design and outside vendors, as well as internal applications requiring exchange through these formats. Feedback to vendors has proven to have no apparent effect.

This software development project was initiated to provide a robust exchange capability between AutoCAD's DXF format and the IGES format. Additionally, at the completion of the project, source code of the translators provides future migration to meet evolving standards and provide exchange capability enhancements. Finally, using the C programming language to write the code provides portability to other hardware running AutoCAD.

ACTIVITY

Initial Objectives

Experience gained from exchanging CAD data between DXF and IGES using available translators made evident that deficiencies occurred in the transfer of much of the annotation, as well as some of the geometry and subordinate entities. To alleviate these problems, requirements for translators were created with the objective of providing visually equivalent transfer where possible. The Initial Graphics Exchange Specification (IGES), Version 3.0,[1] and the AutoCAD V2.5x DXF Format[2] were used for translation requirements.

The general scope of support for the DXF to IGES translation included mapping of the following DXF information.

- Conversion of all geometric entities to an appropriate corresponding IGES entity(s).
- Conversion of all TEXT to corresponding IGES General Note entity representation. Included were the codes for special symbols AutoCAD is capable of generating (for example, %%127, %%D, or %%d mapped to degree symbol representation in IGES).

- Structures such as BLOCK and INSERT mapped to similar representations in IGES; Subfigure Definition and Subfigure Instance, respectively, in this example.

- DXF Itype information maintained using the IGES Directory Entry (DE) Section's Line Font field.

- DXF entity color information maintained using the IGES DE Section's Color field.

- DXF entity layer information maintained using the IGES DE Section's Level field.

- DXF file name, version number, etc. represented in the appropriate IGES Global Section fields.

- System date/time, software version, etc. represented in the appropriate IGES Global Section fields.

The IGES file resulting from this translation also contains correct DE Section field information for providing blank status, subordinate (parent/child) relationships, hierarchy for inheritance of attributes in the case of subordinate relationships, and matrix nesting in the case of subordinate relationships. Support is provided for all IGES Parameter Data (PD) Section parameters required to define an entity.

The general scope of support for the IGES to DXF translation included mapping of the following IGES information.

- Conversion of common geometric entities to an appropriate corresponding DXF entity(s). Included are mappings for IGES Point, Line, Circular Arc, and Composite Curve entities. IGES Spline Curve entity's segment endpoints mapped to DXF POINTS. IGES Conic Arc entities are not translated.

- All forms of IGES Copious Data entities mapped to appropriate corresponding DXF entities.

- General Note entities mapped to DXF TEXT, including special symbols supported by AutoCAD. Rotated text is supported.

- All Leader forms mapped to DXF entities maintaining visual equivalence.

- Subfigure Definition and Instance entities mapped to DXF INSERT and subentities.

- IGES Dimensions, Label, and General Symbol have subordinate entities mapped appropriately.

- Flag Note entity causes processing of subordinate General Note, as well as generation of Flag Note box geometry.

- Sectioned Area's closed boundary processed and mapped appropriately.
- Drawing entity's subordinate annotation processed and mapped appropriately.
- IGES Transformation Matrix supported when placing/defining DXF entities. This includes correct matrix concatenation for both the explicit nesting case and the parent/child nesting case.
- IGES DE Section's Line Font field maintained using DXF Ltype.
- IGES DE Section's Color maintained or DXF entity.
- IGES DE Section's Level maintained for DXF entity.

IGES file information for providing blank status, subordinate (parent/child) relationships, and hierarchy for inheritance of attributes in the case of subordinate relationships is supported. The translators support all IGES Parameter Data (PD) Section parameters required to define an entity.

Project Deliverables and Milestones

The project used structured techniques in software development. Project deliverables and milestones, along with the responsible party, are as follows.

- Software Requirements Document - KCD.
- DXF to IGES Translator Design Document - joint UMKC/KCD.
- IGES to DXF Translator Design Document - joint UMKC/KCD.
- Acceptance Test Plan - KCD.
- Acceptance Test Case(s) Development - KCD.
- DXF to IGES Translator (preliminary code) - UMKC.
- Testing of preliminary DXF to IGES code - KCD.
- Testing Results Document for DXF to IGES - KCD.
- IGES to DXF Translator (preliminary code) - UMKC.
- Testing of preliminary IGES to DXF code - KCD.
- Testing Results Document for IGES to DXF - KCD.
- Final DXF to IGES Translator code - UMKC.

- Final Acceptance Testing of DXF to IGES code - KCD.
- Final IGES to DXF Translator code - UMKC.
- Final Acceptance Testing of IGES to DXF code - KCD.
- Software User/Installation Manuals - UMKC (see Appendices A and B).
- Final acceptance of software and documents - KCD.

All deliverables were successfully met and were completed ahead of schedule.

Additional Capabilities

Early during the project's coding phase, AutoCAD announced their new Version 9. The DXF format associated with this version' was not compatible with earlier versions. Thus, the project that was already underway, if continued according to the design documents, would have resulted in software that quickly became obsolete. It was mutually decided by KCD and UMKC to provide parallel code for the IGES to DXF Translator. When the software is executed, the user is prompted to input which DXF format is to be generated. A DXF Version 9 output contains entities not defined in DXF Version 2.52. By deleting these entities, the file can be treated as a DXF Version 2.52 file. The Version 9 unique entities created by this software are as follows.

- Comment lines (having 999 on the line preceding it).
- $DIMASO (and three lines following it).
- $DIMSHO (and three lines following it).
- $DIMPOST (and three lines following it).
- $DIMAPOST (and three lines following it).
- $DIMALT (and three lines following it).
- $DIMALTD (and three lines following it).
- $DIMALTF (and three lines following it).
- $DIMLFAC (and three lines following it).

Testing of preliminary code revealed fixed length formatting of parameters in the output file. The math coprocessor chip available in personal computers, coupled with double "precision" used in the translator code, makes the precision of calculated parameters on the order of 15 significant digits. It was decided

to allow the user to input the number of decimal places of accuracy (0 to 16, with 6 being the default) to be used for output formatting.

Testing also revealed an IGES file size limitation of approximately 2500 entities. Modifications to translator software were made to dynamically reallocate memory after each entity completed translation. This resulted in the ability to translate files in excess of 3000 IGES entities (or the equivalent sized DXF file).

Software Units

Final delivery at completion of the project included source code for all developed software. Instructions for compilation and linking can be found in the Software User/Installation Manuals attached as Appendices A and B. Individual source files and their functions follow.

For IGES to DXF Translations:

- IGES_DXF.C - Main translator code for manipulating IGES file.
- IGES_VAL.C - Procedures for validating IGES entities.
- IGES_TRA.C - Procedures for converting IGES entities to DXF.
- IGES_DXF.H - An include file (for compilation of other three files) defining constants and structures.
- DEFAULT.DXF - Header portion of Version 9 format DXF file for use when creating new DXF ile.
- DEFAU252.DXF - Header portion of Version 2.5x format DXF file for use when creating new DXF file.

For DXF to IGES Translations:

- DXF_IGES.C - Main translator code.
- DXF_IGES.H - An include file (for compilation of DXF_IGES.C) defining constants and structures.

ACCOMPLISHMENTS

This translator software development project has resulted in software providing visually equivalent, bidirectional translations between DXF and most IGES files. The project resulted in delivery of source code, providing upward migration as either DXF or IGES evolves, as well as software maintenance. Because the source code is written using the C programming language, porting

the software to other hardware platforms is made simple. Documentation provided with the software includes Software User/Installation Manuals detailing entity mappings, error messages, and compilation/linking instructions.

Transfer of test cases between a personal computer and the KCD Cyber-based CAD/CAM production system has made extensive use of Control Data Corporation's VistaCOM* communications software using the broadband network. Near completion of the project, six large (3000 entity) IGES files were successfully transferred by means of this network and were translated to DXF in support of Test Equipment Engineering. Resulting AutoCAD files were visually equivalent to original Cyber based ICEMDDN CAD files.

FUTURE WORK

Software enhancements are desirable to enhance exchange capabilities. Some possible areas of upgrade include the following.

- Enable the DXF to IGES processor to accept Version 9 DXF files.
- Enhance IGES to DXF (Version 9) translation to maintain dimension structures.
- Enhance the IGES to DXF processor to approximate conics.

REFERENCES

[1]Initial Graphics Exchange Specification (IGES), Version 3.0, National Bureau of Standards, NBSIR 86-3359, April 1986.

[2]AutoCAD Reference Manual, V2.5x, Sausalito, CA: Autodesk, Inc., 1986, pp 367-384.

[3]AutoCAD Reference Manual, V9, Sausalito, CA: Autodesk, Inc., 1988, pp 361-382

[4]VistaCOM User Guide, Greenbelt, MD: Control Data Corporation, 1987.

Appendix A

USER MANUAL FOR DXF TO IGES TRANSLATOR

IGES - DXF Translators

User Manual for DXF to IGES Translator

for

Allied-Signal Inc., Kansas City Division

Order 068G243880

Prepared by

Fred Summa

University of Missouri, Kansas City

September 26, 1988

Edited by Jim Bradford

Allied-Signal Inc., Kansas City Division

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I. Execution Instructions

II. Conversion Details

1. Entity Mapping

2. Color, Line Font, Level, and Blank Status Mapping

3. Global Section Support

4. DE Section and PD Section Support

III. Compilation

IV. Error Messages

I. Execution Instructions

The program is executed by entering the program name (DXF_IGES). The program will prompt for the input file name, output file name, whether a compressed listing of the input is desired, and the number of digits (precision) for outputting real numbers.

The file names are the base name only. The program will append the correct suffix to the base name (DXF for input, IGES for output). Paths are not allowed, so the input and output files must be in the current directory.

The compressed listing is of the input file; however, the line feed after each group code and each value is replaced by a semicolon. The group codes and values for each entity are written as a line or lines (less than 80 characters) to the error file. If the compressed listing is chosen, the line numbers for error messages written to the error file are omitted.

A sample run follows:

```
D:DXF_IGES
enter input file basename ? dxf4 (or DXF4)
enter output file basename <DXF4> ?
echo input to error file (y,<n>) ?
Enter decimal places of accuracy (0 to 16) <6> ?
Header Section finished
Table Section finished
Blocks Section finished
Entities Section finished

D:
```

The input file was DXF4.DXF, output file was DXF4.IGS. Only entities with errors were written to the error file (error messages include the line number that the entity starts on), and real numbers were written with 6 digits after the decimal point. The program converted the response to the first question to upper case.

In addition to the input and output file, the program accesses the following files:

```
xxxxxx.ERR --  contains error messages
xxxxxx.$$$ --  contains temporary PD Section lines
               (normally deleted during program
               termination)
```

The xxxxxx is the base name of the output file. The two files are written in the current directory.

II. Conversion Details

1. Entity Mapping (DXF entity mapping to IGES entity)

   ARC -- convert to Circular Arc (100).

   ATTDEF -- do not convert (warn user).

   ATTRIB (if part of INSERT) -- convert to General Note (212) and Property (406).

   BLOCK -- convert to Subfigure Definition (308).

   CIRCLE -- convert to Circular Arc (100).

   DIMENSION -- do not convert (warn user).

   INSERT -- convert to Transformation Matrix (124) and Subfigure Instance (408).

   LINE -- convert to Line (110).

   POINT -- convert to Point (116).

   POLYLINE -- convert to Composite Curve (102).

   SHAPE -- do not convert (warn user).

   SOLID -- convert to Copious Data (106, form 11).

   TEXT -- convert to General Note (212).

   TRACE -- convert to Copious Data (106, form 11).

   VERTEX (must be part of POLYLINE) -- convert each pairing to Line (110) or Circular Arc (100).

2. Color, Line Font, and Level Mapping

   The DXF Ltype resolves to an IGES line font as follows:

   ```
   if entity Ltype or BLOCK Ltype is not entered
       then use the LAYER Ltype instead
   if entity Ltype is BYBLOCK and entity is in a BLOCK
       then use the BLOCK Ltype
   otherwise use the entity Ltype
   map the resulting DXF Ltype to IGES Line Font
   ```

DXF Ltype	Maps to IGES Line Font
SOLID	1 Solid
DASHED	2 Dashed
PHANTOM	3 Phantom
CENTER	4 Centerline
HIDDEN	2 Dashed
OTHER	1 Solid

The DXF color number is resolved as follows:

```
if entity color or BLOCK color is not entered
    then use the LAYER color
if entity color is 0 and entity is in BLOCK
    then use the BLOCK color
otherwise use the entity color
map the resulting DXF color to IGES color
```

DXF Color maps to IGES Color

1	Red	2	Red
2	Yellow	5	Yellow
3	Green	3	Green
4	Cyan	7	Cyan
5	Blue	4	Blue
6	Magenta	6	Magenta
7	White	8	White

The DXF layer (a string) is resolved to an IGES level number as follows:

```
decode the layer as a 3 digit integer or L followed
    by a 3 digit integer
if a valid integer was found between 0 and 255 use
    the integer as the IGES level number else
    use 256
```

DXF layer maps to IGES level

1 OR L1	1
.	.
.	.
.	.
255 or L255	255
others	256

3. IGES Global Section Support

Global Section of IGES File for outgoing IGES file.

Parameter (1-20)	Value (default if not specified)
3	DXF filename without the .DXF
4	DXF filename with .IGS
5	AutcoCAD version number from DXF header
6	"19HBX DXF TO IGES V1.0"
12	Same as parameter 3
13	"1.0"
14	"1"
15	"2HIN"
16	"32767"
17	"32.767"
18	DATE/TIME from DOS in IGES format
19	".0001"
20	Value calculated from LIMMAX and LIMMIN

(for example, ,,7HTESTFLE,11HTESTFLE.IGS,6HAC1002,19HBX DXF TO IGES V1.0,.....
7HTESTFLE,1.0,1,2HIN,32767,32.767,13H871105.083555,.0001,28.9;)

4. DE Section and PD SECTION Support

DE Section Support:

1. Entity Type Number

2. Parameter Data

4. Line Font Pattern

5. Level

7. Transformation Matrix

9. Status Number
   Blank Status
   Subordinate Entity Switch (00, 01, 03)
   Hierarchy (00, 01)

10. Section Code and Sequence Number

11. Same as 1

12. Line Weight

13. Color Number

14. Parameter Line Count Number

15. Form Number

18. Entity Label

20. Section Code and Sequence Number

PD Section Support:

The PD parameters for the generated entities are supported. The property and text back pointers are nonzero only for a Subfigure Instance.

III. Compilation

The program is generated as follows:

DXF_IGES.C (also with DXF IGES.H in current directory) is compiled by means of Microsoft's QC with object and enhancement options on and warnings set to level 3.

Link is invoked with
D:link /NOI /ST:4096 DXF IGES, and the default replies to the first three prompts. When link reports that the default library was not found, enter mlibc7 as the library to use.

A debug version of the program is generated as above except QC is executed with the debug option on and link has /CO added to its command line.

IV. Error Messages

Error messages concerning errors in the input file (DXF) are written to the error file xxxxxx.ERR (where xxxxxx is the output file basename) and the standard error file (the screen). These error messages are preceded by the line number that the (DXF) entity begins with. A compressed copy of the erroneous entity is also written to the error file.

Text enclosed in >< is from the offending line and, therefore, varies. Text enclosed in () indicates one of the enclosed will occur.

couldn't set (SIGINT, SIGABRT, or SIGFPE)
System error

crashed on or after line >number<
Program error - crashed, aborted, or was interrupted (CTR'L C).

```
aaaaaaaa = (0 SECTION 2 HEADER, 0 SECTION 2 TABLES,
            0 SECTION 2 BLOCKS, 0 SECTION 2 ENTITIES,
            0 TABLE 2 xxxxxx, 0 ENDTAB, 0 BLOCK, 0 ENDTAB)

expected  aaaaaaaaaaaa

got       bbbbbbbbbbbb
     Program expected aaaaaaaaaa to occur next but bbbbbbbb
     was encountered (DXF file structure is incorrect).

FATAL - cannot open file >filename< for >operation<
     Error number 99 - (system error message).

group code error ssss
     The group code (ssss) is not a 3 digit integer; ssss is
     the group code and value.

group code >nnn< not valid start
     Program was expecting an entity to start; however, the
     group code read (nnn) was not 0, 2, or 9.

group code >nnn< only valid in header
     Group code 9 (VARIABLE) is only defined in the HEADER
     SECTION.

insert with a x-scale of zero
     The x_scale value will be changed to 1.

invalid lst pair n
     Program was expecting an entity to start; however, the
     group code and value read were invalid.

junk at end of file
     The input file continues after the END OF FILE entity.

no output for entity >ssssssss<
     The DXF entity does not translate into any IGES
     entities.

overflowed block table
     There are more blocks in the BLOCK SECTION than the
     program was compiled to allow, or the length of the
     BLOCK names exceeds the amount that the program was
     compiled to allow.

overflowed layer table
     There are more layers in the LAYER TABLE than the
     program was compiled to allow.

polyline with >xxx< vertices
     The POLYLINE has less than 1 VERTEX.

structure not legal at this point in file  aaaaaaaaaaa
     DXF entity aaaaaaaaaaa should not occur at this point.
```

subfigure not found >ssssss<
The name (ssssss) was not the BLOCK table when the INSERT was being translated into a Subfigure Instance.

too many block DE pointers
The BLOCK has more children (subentities) than the program was compiled to allow.

too many insert DE pointers
The INSERT has more children than the program was compiled to allow.

unexpected EOF
The input file does not end with the END OF FILE entity.

unknown structure >nn1< >value1< >nn2< >value2<
Program was expecting an entity to start; however, the first group code (nn1) and value (value1) occur in more than one entity, and the second group code (nn2) and value (value2) are not equal to a defined entity.

sssssss unknown group code nnn
Group code (nnn) is not a valid ver 2.5x group code; ssss is the group code and value.

nnn - discarded - too much variable storage
The entity has more variable values than the program was compiled to allow.

nnn - gcode - missing required element
The entity is missing a required element - group code (nnn).

nnn - gcode - not allowed for entity
Group code (nnn) is not defined for this entity.

nnn - warning - input text exceeded storage
The group codes and values exceed the amount the program was compiled to allow.

****** entity not supported *****
The program does not translate the DXF entity into any IGES entities.

Appendix B

USER MANUAL FOR IGES TO DXF TRANSLATOR

IGES - DXF Translators

User Manual for IGES to DXF Translator

for

Allied-Signal Inc.

Order 068G243880

Prepared by

Fred Summa

University of Missouri, Kansas City

September 27, 1988

Edited by Jim Bradford

Allied-Signal Inc., Kansas City Division

Table of Contents

I. Execution Instructions

II. Conversion Details

    1. Entity Mapping

    2. Color, Line Font, Level, and Blank Status Mapping

III. Compilation

IV. Error Messages

I. Execution Instructions

The program is executed by entering the program name (IGES_DXF). The program will prompt for the input file name, output file name, whether AutoCAD Version 9 enhancements are allowed, and the number of digits (precision) for outputting real numbers.

The file names are the base name only. The program will append the correct suffix to the base name (IGS for input, DXF for output). Paths are not allowed, so the input and output files must be in the current directory.

The only Version 9 enhancements that are implemented are comment lines (group code 999) at the front of the file and several variables in the HEADER SECTION.

Default selections for the choices are bracketed with <> and will be used if a return (enter) without text is the response to a prompt.

A sample run follows:

```
D:IGES_DXF
enter input file basename ? igs4 (or IGS4)
enter output file basename <IGS4> ?
version 9 enhancements (<y>,n) ?
Enter decimal places of accuracy (0 to 16) <6> ?

DE count = 28 PD count = 32 data storage used = 3194

D:
```

The input file was IGS4.IGS, the output file was IGS4.DXF, Version 9 enhancements were used, and real numbers are written with 6 digits after the decimal point. The program converted the response to the first question to upper case.

In addition to the input and output file, the program may access the following files:

```
xxxxxx.ERR -- contains error messages
xxxxxx.$$$ -- contains temporary DXF lines (normally
              deleted during program termination)
DEFAULT.DXF or DEFAU252.DXF will be read (HEADER and
              TABLE SECTIONS for output file)
```

The xxxxxx is the base name of the output file. The first two files are written in the current directory. The default files are read from the directory where the program resides.

II. Conversion Details

1. Entity Mapping (IGES entity mapping to DXF entity)

100 - Circular Arc
Convert to ARC.

110 - Line
Convert to LINE.

116 - Point
Convert to POINT.

112 - Spline Curve
Convert endpoints of each segment to POINT.

212 - forms 0-8, 100-102, 105 - General Note (gnote)
Convert each text string with parameters to TEXT.

106 - form 1,2,3 - Copious Data, (points)
Convert each set of x,y,z coordinates to POINT.

106 - form 11,12,13 - Copious Data, (lines)
Convert each pair of x,y,z coordinates to LINE.

106 - form 20,21 - Copious Data, (centerline)
Convert each odd pair of coordinates to LINE.

106 - form 40 - Copious Data, (witness line)
Convert each even pair of coordinates to LINE.

106 - form 31-38 - Copious Data, (section)
Convert each even pair of coordinates to LINE - if the font pattern is not a DXF line type, use continuous.

106 - form 63 - Copious Data, (simple closed area)
Convert each pair of coordinates to LINE.

NOTE: 106 copious data consist of 1 or more sets of points (x,y,z coordinates). All pairs means a pair from point 1 to point 2 (pair 1), a pair from point 2 to point 3 (pair 2), etc. Even pairs are pair 2, pair 4, etc. Odd pairs are pair 1, pair 3, etc.

214 - form 1-11 - Leaders
Generate each arrow head with LINEs or CIRCLE convert each pair of x,y,z coordinates to LINE.

408 - Subfigure Instance
Convert to INSERT (Z rotation lost).

NOTE: The following IGES entities contain one or more children. Each child will be converted individually (as detailed above) after having appropriate parent information applied to it.

102 - Composite Curve
Convert children (arc, line, spline, point).

206 - Diameter Dimension
Convert children (gnote, leaders).

210 - General Label
Convert children (gnote, leaders).

216 - Linear Dimension
Convert children (gnote, leaders, witness lines).

218 - Ordinate Dimension
Convert children (gnote, leader/witness line).

220 - Point Dimension
Convert children (gnote, leader, circ arc/comp curve).

222 - Radius Dimension
Convert children (gnote, leader).

228 - General Symbol
Convert children (gnote, leaders, Geometry).

230 - Sectioned Area
Convert children (simple closed curves, comp curve).

202 - Angular Dimension
Convert children (gnote, leaders, witness lines) except convert 1st pair of each leader to ARC.

208 - Flag Note
Generate box (5 LINEs);
Convert children (leaders, gnote).

308 - Subfigure Definition
Convert children.

404 - Drawing
Convert children in annotation list.

PD data for all other IGES entities will be ignored except for 124 - Transformation Matrix. The DE data for any IGES entity may be used to define line attributes (color, etc.) or coordinate transformations.

2. Color, Line Font, Level, and Blank Status Mapping

IGES Line Font maps to DXF Line Font

1	Solid	SOLID
2	Dashed	DASHED
3	Phantom	PHANTOM
4	Centerline	CENTER
	Other	SOLID

IGES Color maps to DXF Color

0	No color	1	Red
1	Black	1	Red
2	Red	1	Red
3	Green	3	Green
4	Blue	5	Blue
5	Yellow	2	Yellow
6	Magenta	6	Magenta
7	Cyan	4	Cyan
8	White	7	White

IGES levels map to DXF layers

0	1
1	1
.	.
.	.
.	.
255	255
...	255

Blanked entities are placed on layer with a B appended to the level. This layer is frozen, making it invisible.

III. Compilation

The program is generated as follows:

IGES_DXF.C, IGES_VAL.C, and IGES_TRA.C (also IGES_DXF.H in the same directory) are each compiled by means of Microsoft's QC with object and enhancement options on and warnings set to level 3.

Link is invoked with
D:link /NOI /ST:3076 IGES_DXF+IGES_val+IGES_tra and the default replies to the first three prompts. When link reports that the default library was not found, enter mlibc7 as the library to use.

A debug version of the program is generated as above except QC is executed with the debug option on and link has /CO added to its command line.

IV. Error Messages

Error messages concerning errors in the input file (IGES) are written to the error file xxxxxx.ERR (where xxxxxx is the output file basename). These messages start with the section and number of the offending line, that is, >P 8< or >D 724<.

Error messages concerning the operation of the program are written to the standard error file (the screen) and may or may not be preceded with a section and count.

Text enclosed in >< is from the offending line and, therefore, varies. Text enclosed in () indicates one of the enclosed will occur.

The following are errors written to the the error file listed first, followed by those written to the screen.

Preceded by >Gnnnnnnn<

global section is missing terminator
Global section lines do not end with a terminator.

separator/terminator definition problem
Error was found in decoding the separator and/or terminator character(s).

Preceded by >Dnnnnnnn<

invalid directory entry
One or more of the directory entry fields was invalid.

aaa = blank status, subordinate entity switch, use, or hierarchy.

aaa - >value< is less than >minimum<
DE status subfield value is less than the minimum allowed.

aaa - >value< is greater than >maximum<
DE status subfield value is more than the maximum allowed.

xyz = entity type, parameter data, structure, line font pattern, level, transformation matrix, status, line weight, color, parameter line count, form, entity label, or entity subscript.

xyz - not a valid IGES integer
Value of DE field (xyz = entity type, parameter data, etc.) was not a valid IGES integer.

xyz - >value< is less than >minimum<
Value of DE field xyz is less than the minimum allowed.

xyz - >value< is greater than >minimum<
Value of DE field xyz is greater than the maximum allowed.

- DE pointer is not a valid IGES integer
The DE pointer field of a PD line is invalid.

- DE pointer too big
The DE pointer field of a PD line is more than allowed.

- entity >type< not translated
The entity is not translated into DXF entities.

- ignoring subentity
The entity will not be converted (because of previous error).

- has child >DE sequence< of expected type >type<
An entity being translated has a child of a type that is not translated.

- insert translation problem
The Subfigure Instance's Transformation Matrix contains transformations not possible in INSERT.

- nested subfigure definition
The input file contains nested Subfigure Definitions.

- matrix pointer invalid
The matrix pointer in the DE entry for the entity does not point to a Transformation Matrix and is nonzero.

- constant truncated
The constant contains special characters which (when expanded) caused the resultant string to exceed 255 characters. The constant was truncated to the first 255 characters.

Preceded by >pnnnnnnn<

- entry not terminated
  The lines of a PD entry are not terminated.

- PD >type< & DE >type< are types differ
  The type of the PD entry (1st field) is not equal to the entity type of the DE entry pointed to by the DE pointer.

- DE pointer to PD >count.DE< should be >count.PD<
  The sequence of the first line of the PD entry (count.PD) is not equal to the DE pointer (count.DE) in the DE entry pointed to by the DE pointer.

- not converting this type >IGES_type<
  The program does not convert IGES entities of IGES_type to DXF entities.

- assoc list - DE pointer - illegal type or value
  The associativity list of a PD entry contains a DE pointer that is invalid (not an integer or out of range).

- prop list - DE pointer - illegal type or value
  The property list of a PD entry contains a DE pointer that is invalid (not an integer or out of range).

- assoc list - DE count - illegal type or value
  The associativity list of a PD entry begins with an invalid count.

- prop list - DE count - illegal type or value
  The property list of a PD entry begins with an invalid count.

program bust - store_PD_value
  Program error.

- invalid value col=xx (unterminated value, invalid Hollerith constant, invalid real constant, or invalid constant).

  The field (in the PD entry) beginning at column xx is not a valid IGES constant.

- too many values
  There are more PD values in the PD entry than the program was compiled for.

- col = xx (invalid real, not a valid IGES integer or Hollerith trailing sep/term problem).

  The field (in the PD entry) beginning at column xx is not a valid IGES constant.

- col = xx warning - Hollerith string will be truncated.
  The Hollerith constant beginning at column xx is longer than the maximum AutoCAD allows (255 characters) and will be truncated to the first 255 characters.

- col = xx overfloved text area for a PD entry
  The Hollerith strings contained in the PD entry exceed the maximum length the program was compiled for.

- not enough PD values
  The entity type of the PD entry requires more values than entered.

- incorrect type for PD value
  The entity type of the PD entry requires different value types than entered.

- number of entities - illegal type or value
  The entity type of the PD entry requires a positive integer as the number of subentities.

- entity list - too few values
  The number of subentities required is more than PD values entered.

- entity list - DE pointer - illegal type or value
  The DE pointer(s) in the entity list is not a positive integer less than the maximum allowed by the program.

- pointer wrong type or not zero
  The DE pointer (entity type is POINT) is not an integer or zero.

- ignoring entity
  The entity will not be converted (because of previous error).

Preceded by >Tnnnnnnn<

- terminate section - (start field, global field, directory entry field, or parameter data field) (not a valid IGES integer or section letter or count invalid).

The final sequence numbers from the terminate entry cannot be decoded or do not agree with the numbers contained in the sections of the input file.

Miscellaneous - may be in any section

- length of line not 80 >length<
  The offending line is not exactly 80 characters long.

Written to screen

Unknown leader form
  Program error.

Couldn't set (SIGINT, SIGABRT, or SIGFPE)
  System error.

crashed on or after >(T, P, D, G, or S) number<
  Program error - crashed, aborted, or was interrupted (CTR'L C).

FATAL - cannot open file >filename< for >operation<
  Error number 99 - (system error message).

- start section counts are not consecutive - prev >x<

- global section counts are not consecutive - prev >x<

- DE section counts are not consecutive - prev >x<

- PD section counts are not consecutive - prev >x<

- terminate section counts are not consecutive - prev >x<.

  The sequence numbers (counts) must start with 1 and increment by 1.

- missing global section

- missing DE section

- missing PD section

- missing terminate section
  The above sections must occur and be in the correct order.

out of memory
  Program could not obtain more memory to hold entity.

problems with default.DXF file
    The default.DXF (defau252.DXF) file is not formatted properly.

layer table is empty
    Program error.

overflowed level table
    The input file has more levels than the program is compiled to allow.

- overflowed waiting table
    The program was not compiled with enough storage to process the input IGES file.

- unknown dimension type
    Program error.